WORKPLACE SAFETY AND HEALTH DIVISION

MANITOBA

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MERCURY REPORT
IN
DENTAL OFFICES

SURVEY FOR MERCURY VAPOR IN MANITOBA DENTAL OFFICES

SUMMER 1983

Abstract

The Workplace Safety and Health Division, Department of Environment, Workplace Safety and Health undertook a survey of 35 randomly selected dental offices to assess to what extent elemental mercury presented a health hazard to dental personnel. Analysis of hair and urine, breathing zone air and monitoring of room air were utilized to determine human exposure. An assessment of work conditions and mercury hygiene practices was made to assist in evaluating exposure patterns. A questionnaire was used to assess non-occupational exposure.

Urine analysis showed that seven dental assistants and three dentists had urinary mercury levels exceeding the normal of 30 ug/l (Kelman 1978). Hair analysis showed that two dental assistants and four dentists had mercury in hair concentraions which exceeded the 1972 World Health Organization Standard of 6 ppm. No breathing zone samples exceeded the American Conference of Governmental Industrial Hygienist, Threshold Limit Value, Time-Weighted Average of 50 ug/m^3.

High concentrations of mercury in air was detected above carpets, around amalgamators, in waste bins, and vacuum cleaner bags. Unhygienic methods of dispensing and handling mercury containing materials were utilized in some offices.

The survey found that a risk of mercury exposure existed and that some work practices employed in some offices were inappropriate. Recommendations for hygienic mercury handling techniques are made in the report.

Introduction

The Workplace Safety and Health Division has conducted a survey of dental offices in Manitoba. The purpose of the survey was to determine to what extent elemental mercury presented a health hazard to dental personnel. The survey comprised of four components.

1. Environmental Monitoring:

   - Area monitoring of specific areas.
   - Personal air samples in the breathing zones of the dentist and dental assistant.

2. Biological monitoring of hair and urine.

3. Questionnaire to identify other potential sources of exposure to mercury, eg. use of cosmetics, lifestyle, diet, hobbies, habits, work practices. (Appendix 1).

4. Assessment of work environment, eg. ventilation, housekeeping, storage and disposal of mercury and mercury contaminated materials. (Appendix II and III)

Interest in the area was first initiated by a former dental assistant who was working in that capacity from 1969 - 1978. She reported that she had suffered severe and chronic health problems which she believed to have been caused by mercury. As a result of this concern a survey of dental offices was undertaken. Literature sources indicate that personnel in 10 - 35% of dental offices may be exposed to levels of mercury vapor in excess of the exposure criteria of 50 ug/m^3.[2, 3, 5, 7,] It is estimated that the average dentist spends about 50% of his total time in amalgam related procedures.[17]

Toxicity of Mercury

Mercury is very toxic in most of its forms, organic mercury being the most toxic. There is evidence that inorganic mercury converts to organic mercury in the body by the action of bacteria in the absence of oxygen.[22]

Mercury enters the body by inhalation, ingestion or absorption through the skin. Mercury contamination of hands or clothes may increase the concentration of mercury vapour in the breathing zone. Inhaled mercury is almost totally absorbed into the blood stream, some remains in the blood stream, some is absorbed into tissue such as the brain, lungs, liver, spleen and bone. Mercury is excreted mostly in urine, a small amount is excreted in feces

and breast milk. Urinary mercury concentration reflects body burden[20] it accounts for 25 - 33% of mercury absorbed through the lungs.

There is slow turnover of mercury in brain tissue and therefore a high concentrations of mercury remain in the brain long after exposure has ended. The nervous system accumulates mercury to the greatest extent.[42] Therefore the greatest damage is to the nervous system. Motor and sensory peripheral nerve conduction can be affected.[22] Usual symptoms manifested are fine intention tremors of the hands, eyelids, arms and legs. There is progressive alteration in hand writing (leading to illegibility), lack of co-ordination, speech disorders, weakness, muscle cramps, parasthesia, tingling and numbness plus many other symptoms which may vary from one person to another.

The neuropsychological system is affected and is manifested in psychological disturbances such as temper outbursts, excitability, shyness, apprehension, withdrawal, resentment to criticism, headache, unusual fatigue, indecision, inability to concentrate, anxiety, decrease productivity, memory loss, loss of self-confidence, loss of self esteem, depression, etc.. These symptoms are very distressing and disabling, they also persist even though the person is no longer exposed.[12]

Other organs affected include the eyes, kidney, lungs, mouth, and the gastro-intestinal tract .

Mercury passes the placenta barrier, and may cause damage to the infant which may not be evident at birth. Infants may develop mental and motor disabilities, manifested in retardation, cerebral palsy and/or seizures in the newborn.[19] These problems may develop even though the mother has no clinical signs of poisoning. Maternal mercury blood level exceeding 25 ug/dl has demonstrated evidence of severe brain damage.[19] Breast milk is presumed to contain 5 - 6% of the mercury concentration in maternal blood.[19]

Definition of Terms

The American Conference of Governmental Industrial Hygienists (ACGHI) Threshold Limit Value (TLV) refers to airborne concentrations of substances and represents conditions under which it is believed that nearly all workers may be repeatedly exposed day after day without adverse effects. Because of wide variations in individual susceptibility, a small percentage of workers may be affected by the aggrevation of pre-existing conditions or development of an occupational illness.[1] Threshold Limit Value, Time Weighted Average (TLV,TWA) is the time weighted average concentration for an 8 hour day and a 40 hour work week to which nearly all workers may be repeatedly exposed, day after day,

without adverse effects. The ACGIH TLV,TWA for mercury vapor is 50 ug/m^3.

Referring to the study conducted by Koos and Lango, they recommended that for pregnant women exposure level be reduced to 10 ug/m.[19]

Biological Limit Values (BLV's) are the measurements of exposure made by determinations in blood, urine, hair, nails, in body tissue and fluids the amount of substance to which the worker is exposed.

Health and Welfare Canada has adopted the BLV for mercury in hair as set out by the World Health Organization in 1972. Up to 6 parts per million (ppm) is considered acceptable. Persons with concentration of mercury in hair of 6 to 30 ppm are at significant risk of developing symptoms of over exposure.[50] There is some dispute about the BLV of mercury in urine . Kelman in his study stated that a reasonable figure for the non-occuptionally exposed worker would be 20 to 25 ug/l, taking the upper limit of normal to be 30 ug/l.[18]

Survey Method, Procedure and Findings

Thirty-five dental offices were randomly selected and surveyed, this being approximately 10% of the dentists in general practice in Manitoba. Twenty-seven offices were in Winnipeg, two in Brandon, two in Portage la Prairie, one each in Tuelon, Stonewall, Selkirk and Morden.

Area Air Sampling

A Bacharach Mercury Vapour Sniffer Model MV2 was used to monitor for the presence of mercury vapour in the dental offices. The Bacharach Mercury Vapour Sniffer is a portable mercury vapour detecting instrument. It operates on the principle of ultraviolet photometry. The lower detectable limit of the sniffer is 10 ug/m^3 and it was set for the range of 0 - 120 ug/m^3. The sniffer was calibrated to a zero reading outside the building. Office temperature was recorded. Readings were taken approximately 15 - 20 cm of the floor. The carpets were brushed before a reading was taken. Counter tops were monitored in the same manner, then the counter was wiped with the hand and the hand was monitored. The reception area, rest area, laboratory, offices and in some cases the basement was monitored. Other areas monitored were the dentists chair, saliva ejectors, amalgamators, waste bins, curtains, vacuum cleaner bags, drawers, cupboards, hands and clothes. (Appendix III)

Offices were monitored between 0830 - 1300 hours. It is assumed that highest levels can be expected early in the morning when the clinic has been closed overnight. However, temperature may be a significant factor in the afternoons. Vaporization increases as temperature rises. All offices monitored had air conditioning and one would expect the temperature to remain fairly constant regardless of outside temperature.

The readings were recorded as trace (< 20 ug/m^3) low (20 - 49 ug/m^3), moderate (50 - 120 ug/m^3), and high (> 120 ug/m^3), and the highest reading in each area was recorded.

RESULTS

Ambient Air - (N = 35)

Ambient air was monitored throughout the office. Reception areas had low readings, higher readings were recorded in the operatory and laboratory where amalgam was stored dry in an uncovered container, where used instruments were stored, around uncovered waste bins and around amalgamators.

TABLE I

Concentration	< 20 ug/m^3	20-49 ug/m^3	50-120 ug/m^3	>120 ug/m^3
Frequency	26	5	2	2

Table I illustrates that twenty-one offices had concentrations of mercury vapor which were below the standard of 50 ug/m^3 and four offices had concentration of mercury vapour in excess of the standard of 50 ug/m^3.

Floors

Of the thirty-five dental offices surveyed, twenty operatories had carpets, nineteen with low pile and one with high pile. Fourteen had tile or linoleum, and one had wooden floors. Most flooring was in good condition. The worn out spots on the carpeted floors were in the heavily trod areas around the dental chair. The linoleum, tile and wood floors had low readings less than 20 ug/m^3. Some areas on the carpeted floors had readings which exceeded 120 ug/m^3. Higher readings were obtained on the dental assistant's side.

Carpeted Floors (N = 20)

TABLE II

Concentration < 20 ug/m^3	20-49 ug/m^3	50-120 ug/m^3	>120 ug/m^3
Frequency 7	4	5	4

Table II illustrates that nine offices (45%) had a concentration of mercury vapor in excess of the standard of 50 ug/m^3 as measured 20cm above the floors.

Counters (N = 35)

Counter tops were smooth formica type with and without seams. Some counters were one piece construction extending approximately 10 cm up the wall. Reading above counter tops ranged from nil to high. The high readings were obtained around the amalgam storage area, where scrap amalgam was stored dry in an uncovered container, around the amalgamator and in some cases above the seams.

TABLE III

Concentration < 20 ug/m^3	20-49 ug/m^3	50-120 ug/m^3	>120 ug/m^3
Frequency 23	6	3	3

Table III illustrates that six offices (17%) had a concentration of mercury vapor in excess of the standard of 50 ug/m^3 as measured 20 cm above the counter. In some cases a hand was brushed over the counter, and the hand was monitored. In most cases a high reading was recorded.

Amalgamators

The most common models were Caulk and Silamet. The presence or absence of covers on the amalgamators did not have an effect on the level of mercury in the surrounding area. However the

concentration of mercury was greater where reusable capsules were used.

Twenty-nine dentists used pellets with reusable capsules, one used powder and six used disposable capsules.

Amalgamator Using Disposable Capsules

N = 6

TABLE IV

Concentration	< 20 ug/m^3	20-49 ug/m^3	50-120 ug/m^3	>120 ug/m^3
Frequency	5	0	1	0

One office (17%) had a mercury vapour concentration in excess of 50 ug/m^3 in the amalgamator area.

Amalgamators Using Reusable Capsules With Pellets And Powder

N = 29

TABLE V

Concentration	< 20 ug/m^3	20-49 ug/m^3	50-120 ug/m^3	>120 ug/m^3
Frequency	12	6	4	7

Eleven offices (38%) had mercury vapour concentration in excess of 50 ug/m^3 in the amalgamator area.

Where vacuum cleaners were on the premises, the bag and exhaust outlet was monitored. A concentration greater than 120 ug/m^3 of mercury vapour was recorded on all vacuums from the bag or the exhaust.

Personal Air Samples

Personal air samples were collected in the breathing zones of the dentists and dental assistants. The dentist and dental assistant each wore a Dupont Constant Flow Sampler for four hours continuously. The Dupont Constant Flow Sampler is a personal air sampling instrument that moves a constant volume of air flow through an external collection device.

The sampler was calibrated at the flow rate of 50 ml/min. The National Institute of Occupational Safety and Health (NIOSH) method S199 was used. This method was developed by the Los Alamos Scientific Laboratories (LASL). The LASL sampling tube contains a absorbent of silvered chromosorb P to collect elemental mercury vapour.[27] The tube was preceded by a glass fiber filter to collect particulate. The sampling tube was analyzed by thermal desorption of mercury into an absorption cell of a flameless atomic absorption spectrophotometer. The filters were acid digested and then analyzed by atomic absorption spectrophotometry.

RESULTS

All results from tubes and cassettes were below the ACGIH TLV, TWA of 50 ug/m^3 at the time of monitoring (TABLE VI).

TABLE VI

Concentration ug/m^3	<20 ug/m^3	20-49 ug/m^3	>50 ug/m^3
# Dentists N = 35	27	8	0
# Dental Assistant N = 35	27	8	0

Biological Samples

Hair samples were collected from the dentist and dental assistant. Hair from the nape or occipital region is considered appropriate specimen type. The specimen consisted of the newest hair growth, approximately the first 4 cm from the scalp. This sample provides a measure of the average blood level over a growth period of about one month. Approximately 0.5 gms was collected and placed in an envelope. Possible exogenous contamination of hair was assessed by recording the type of cosmetics, shampoos, hair conditioners,

dyes or other products used on hair (for detailed description see Appendix I).

First voided morning urine was collected for the sample. First morning sample is least variable and most contrated.[6] The early morning sample provides the best indication of mercury remaining in the body. Mercury levels fluctuate during the day. Research using a radioactive tracer method concludes that average urine mercury concentration reflects body burden. Urinary excretion accounts for 25 - 30% of merucry vapour absorbed through the lungs.[20]

RESULTS

Mercury in Hair - PPM (Parts Per Million)

TABLE VII

Concentration	< 6 ppm	6-30 ppm	> 30 ppm
# Dentists (N = 35)	31	4	0
# Dental Assistants (N = 34)	32	2	0

Mercury in Urine (ug/l)

TABLE VIII

Concentration	<20 ug/l	20-29 ug/l	30-40 ug/l	>40 ug/l
# Dentist N = 35	31	2	2	1
# Dental Assistant N = 34	31	3	2	5

MERCURY HYGIENE PRACTICES

Preparation of Amalgam

This procedure has the greatest potential for mercury spillage and contamination. Metallic mercury is used in the preparation of amalgams. It is dispensed into a capsule, combined with another alloy, and placed on the amalgamator where it is agitated. The dental assistant dispenses the mercury, and prepares the amalgam. It was observed that the mercury was dispensed over the counter, or the floor or over the lap. Spills can occur at this time. The spills may be minute, but over a period of time the accumulation of mercury in the carpet may cause excessive vaporization, especially at the dental assistant's side of the chair. Where there are no carpets, the droplet may roll under the chair into seams, along baseboards, accumulate and vaporize.

There is some reason to believe that the capsule may not seal properly, and that during amalgamation, mercury droplets may escape and accumulate in the amalgamator and/or the storage drawer. A cover on the amalgamator may not prevent the escape of mercury from a leaky capsule.

Following amalgamation the capsule is opened and the amalgam is transferred into a Dappen dish or onto a squeeze cloth. The Dappen dish method was used in eighteen offices. When the amalgam was transferred onto a squeeze cloth, it was hand mulled by the dental assistant. Eleven dental assistants used this method without any skin protection. Six dental assistants used the squeeze cloth with a rubber dam. The rubber dam offers some skin protection, but may contribute to mercury spills. Minute droplets of mercury may roll off the rubber dam.

Hand mulling without skin protection may be a factor contributing to excessive exposure. Mercury is absorbed through the skin, hands contaminated with mercury may increase vaporization in the breathing zone, and contaminate clothes items, counter tops, etc., thus increasing mercury vapor in the atmosphere. This was not reflected in the study of the seven dental assistants who had elevated mercury in urine, two used the squeeze cloth without a rubber dam, one used a squeeze cloth with a rubber dam, and four used the Dappen dish.

The number of amalgams per month did not influence the level of mercury in hair or urine, but the number of mercury related procedures carried out during monitoring had a direct influence on the level of mercury vapor collected by the personal air samples. The greater the number of procedures, the higher the results, eg.

where 12 amalgam procedures were conducted, the dentist's personal air sample collected 37.5 ug/m^3 and the dental assistants had a level of 45.5 ug/m^3 but where only 7 amalgam procedures were done a level of 15.7 ug/m^3 was recorded. The highest level recorded in the personal air samples was 45.5 ug/m^3. There were no samples exceeding 50 ug/m^3.

Storage and Disposal of Scrap Amalgam

Scrap amalgam was stored in a variety of receptables, ie., tin cans, paper cups, plastic containers, or glass jars. Two dentists discarded scrap amalgam into the waste bin. Twelve dental offices stored the scrap amalgam dry in a covered container. Six offices stored the scrap amalgam dry in an uncovered container. Fifteen dental offices stored the scrap amalgam in a container, covered by water, spent x-ray fixer or a mercury suppressant. High concentraions of mercury vapour were detected with the mercury sniffer where amalgam was stored dry in uncovered containers.

Old mercury was stored in a glass jar. The hazard of breakage exists, which could contribute to a large spill. Both scrap amalgam and mercury are recycled.

It was observed that there was no eating, drinking or smoking in the operatories. Rest areas were available in most offices. Dental personnel wore uniforms or lab coats. Five dental offices reported that masks were always worn by the dentist and assistant, nineteen reported that masks were used sometimes,and eleven reported that they were never used. In most cases surgical masks were used for protection of personnel or client from infection. Some dental offices had particle masks effective for mercury particulate. Hubbard et al, concluded that masks captured most mercury rich material which would otherwise be respirable.[44] He recommended that particle masks be worn by dental personnel.

Summary and Comments

Sources of Mercury Contamination

- Improper storage, handling and disposal of amalgam, mercury or mercury contaminated materials allows release of mercury vapour into the work environment.

- Drilling out old amalgam, polishing and grinding. When dry drilling is done the instantaneous mercury level in the

breathing zone may exceed the TLV by as much as 10 times. When drilling, polishing or grinding is done with water, the mercury level is less than TLV.[6]

- Possibility of leaky capsules - in some cases mercury vapour readings were high in the vicinity of amalgamators when reusable capsules were used.

- Mercury spills - dental assistants dispensed mercury over the counter, floor, or lap. Higher mercury reading were recorded on the dental assistants side of dental chair.

- Housekeeping - mercury combines with dust and settles on flat surfaces.

- The use of an ordinary household vacuum cleaner - The mercury is then dispersed into the work environment during vacuuming and vaporizes continuously while vacuum cleaner is stored.

- Sterilization of mercury contaminated instruments by heat increases vaporization. Auto claves exhausted into the atmosphere will release mercury vapour into that atmosphere. Heat does not destroy mercury.

- Air conditioners, fans or motorized equipment break-up the droplets of mercury and recirculate it in the work area.

Conclusion

The results of the survey indicate that the potential for mercury exposure exists. Dentists and auxiliary staff may be at risk of developing health problems associated with mercury exposure. It was observed that contibuting factors to mercury exposure were unsafe mercury hygiene practices, improper storage and disposal of mercury containing materials, and spillage. There was no one single factor that could be identified as being the major contributing factor, (see Appendix 4). All dental personnel must acknowledge the hazard of mercury, and implement measures and work practices to reduce exposure.

Recommendations

I. That the following housekeeping practices be implemented.

Storage... - store mercury in a tightly sealed unbreakable container.

- store scrap amalgam in a tightly sealed container under used x-ray fixer or a commercially prepared mercury suppressant.

- store mercury contaminated materials in a sealed plastic bag until disposal.

- store mercury containing materials in a cool place.

Handling...

- use a "no touch" technique when handling mercury or amalgam.

- prepare amalgam over a tray to confine any spill.

- use a rubber dam or gloves when using a squeeze cloth to avoid contact with skin.

Disposal...

- Scrap amalgam and other mercury containing materials should be stored as described above, and returned to a supplier or shipped to a metal refinery for recycling.

Dental Procedures...

- drilling, polishing and grinding should be done with water.

Personal Habits...

- wash hands and under nails with a nailbrush after handling mercury containing material and before eating, smoking, or leaving work.

- use an indicator soap to determine successful removal of mercury from skin.

- do not bring cigarettes, food or cosmetics into the operatory.

- use of an approved respiratory protective device is recommended when placing or removing amalgam.

- change clothes and shoes before leaving work.

Housekeeping...

- use a mercury suppressant for cleaning counter tops, floors, chairs, etc..
- change air filters frequently, (about every two months).
- consider using an air purifier designed to filter out mercury vapour.
- use a special vacuum cleaner with special filters to remove mercury or its residue.

Office Design...

- have seamless, non-porous flooring and counter tops.
- counters should be sloped 5° backwards to allow mercury to accumulate in one area, making clean-up easier.

Spills and Leaks...

- check capsules for leakage by wrapping adhesive tape around the junction and examine the tape for mercury after trituration.
- use only well-fitting capsules.
- clean spills promptly.
- consider using disposable capsules.

Cleaning-up Spills...

- coat the contaminated area with a mercury suppressant, then, depending on the size of the spill, clean as follows:

  a) small spills may be picked up with adhesive tape or a hypodermic syringe.

  b) large spills may be suctioned into a bottle trap or vacuumed with a special vacuum with filters approved for mercury vapour.

- repeat the cleaning procedure.
- monitor the area using a mercury sniffer.

II. That a course on "Occupational Hazards and Their Control" be implemented into the curriculum for all dental personnel.

III. That all dental assistants be trained in an educational institution.

IV. That a regularly scheduled monitoring program be conducted, which would consist of monitoring and assessment of mercury hygiene practices. It is advisable to implement a voluntary program of biological monitoring in the form of urinary mercury determinations, which have been shown to be valid and effective as a reasonably good index of inorganic mercury exposure. The frequency of testing will depend on the high risk work and medical indications.

To pick up scrap mercury please call or write:

Waste Management Division,
Environment Control Service,
Building 2, Fort Osborne Complex,
139 Tuxedo Blvd.,
Winnipeg, Manitoba,

Telephone 944-7083

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50. World Health Organization, Recommended Health - Based Limits in Occupational Exposure to Heavy Metals, Report of WHO Study Group, Technical Report Series 647 (Geneva, Switzerland, 1980)

APPENDIX I

Confidential Health History

Dental Office: Date of Interview:

Address: Time of Interview:

A. Biographical Data

1) Name _____

Sex ( )M ( )F

Height _____

Weight _____

Date of Birth _____

B. Family History

1) Are there other members of your household exposed to mercury?

a) from where are they exposed? _____

b) how frequently are they exposed? _____

C. Occupational History

1) Occupation (please circle correct response)

a) dental assistant

b) dentist

c) other: _____

2) Number of years spent in dental environment (including school years): _____

3) Present place of employment:

a) date employed _____, 19 __

b) number of hours per week that you work _____

c) number of dentists practicing in this dental office _____

4) Are you presently working at another job? _____

a) if yes, date employed _____, 19 __

b) employer's name _____

c) address _____

d) job description _____

5) Previous employment

a) date employed _____, 19 __

b) date terminated _____, 19 ___

c) employer's name _____

d) address _____

e) job description _____

6) Previous employment

a) date employed _____, 19 ____

b) date terminated _____, 19 ____

c) employer's name _____

d) address _____

e) job description _____

D. Use of Cosmetics

1) Please list names of cosmetics used:

a) creams _____

b) lotions _____

c) shampoo/conditioner/rinse _____

d) hair dyes/bleaches _____

e) other _____

E. Recreational Activities (eg. swimming, fishing)

1) Please list:

F. Habits

1) Do you . . . a) smoke ( ) yes ( ) no

b) bite your nails ( ) yes ( ) no

G. Diet

1) Do you . . . a) eat fish ( ) yes ( ) no

b) if yes to (a), then how much per week? _____

what kind? _____

from where is it bought/caught? _____

H. Health Status

1) Please rate your health by placing an "x" on the following scale.

very poor 1 2 3 4 5 6 7 8 9 10 Excellent

comments:

2) Have you ever been exposed to mercury outside of job routine? ( ) yes ( ) no

3) Have you ever been involved in cleaning up a mercury spill? ( ) yes ( ) no

4) If yes to #3, how long ago? _____

b) how was the spill cleaned up?

c) did you receive follow-up medical services? (elaborate, if yes)

I, _____ understand and agree that the Manitoba
(signature)

Workplace Safety and Health Division may contact my physician to obtain further information relevant to this study (eg. results of previous blood or urine tests for mercury).

I would like the Workplace Safety and Health Division to supply my physician with the results of the hair and urine analyses, ( )yes ( ) no.

Name of your physician: _____

Address: _____ postal code: _____

Date of last physical examination _____, 19 ____.

Thankyou for your cooperation.

APPENDIX II

Mercury Hygiene Questionnaire

Date: _____
Name of Respondent: _____
Initials of Questionner: _____

A. Description of Office

1. Size of operatory(s) (ft^3 or m^3): _____ _____ _____ _____

(OBS) 2. Location of carpet: a) throughout entire office
b) in the waiting area only
c) in operatory
d) no carpeting in office

3. Type of carpet: a) high pile
b) low pile

comments:

4. How are carpets cleaned? a) vacuum
b) vacuum with special filter
c) other: _____
d) how often are they cleaned? _____

(OBS) 5. What is the type of flooring (if applicable)?

comments:

(OBS) 6. What is the condition of the flooring?

(OBS) 7. What material is used as counter surface?

(OBS) 8. What is the condition of counter surface?

B. Air Ventilation

1. Type: a) recirculatory
b) non-recirculatory
c) other: _____

2. Are special filters utilized? ( )yes ( ) no

3. If yes to #2, how often are they changed?

4. a) Are there windows which can be opened? ( )yes ( ) no
b) If yes to (a), when are they opened?

APPENDIX III

PROCEDURE FOR MERCURY MONITORING IN DENTAL OFFICES

Mercury Sniffer

1. Monitor outside air to get zero check.

2. Record temperature in office at time of monitoring.

3. Disturb pile on carpet and take reading approximately 30 cm. off the floor.

4. Sample following areas:

Ambient air -

atmosphere

30 cm off floor tiled

rug

Counter top -

near amalganator

30 cm. off counter

Floor - tile - dentist

rug - dentist

tile - assistant

rug - assistant

5. a) Are (electric) fans utilized? ( )yes ( ) no
   b) If yes to (a), where are they used? _____

C. Heating System

1. Type: a) electricity
   b) forced air
   c) steam
   d) other: _____

2. a) Are special air filters used in heating system? ( ) yes ( ) no
   b) If yes to (a), when are they changed? _____

D. Mercury Exposure

1. What alloy system is used? a) powder
   b) pellets
   c) disposable capsules
   d) other: _____

2. Approximately how many amalgams are done per day? _____

3. What is done with scrap amalgam? a) stored
   b) disposed of

4. a) How is the scrap amalgam stored/disposed of?

   b) And for how long?

5. What is the name of the amalgamator (model)? _____

6. How many amalgamators are there? ____

(OBS) 7. Do they have covers? ( )yes ( ) no

8. What procedure is used in working with amalgam?

9. Are masks ever worn? ( )yes ( ) no

10. If yes to #9, a) what type are used? _____
    b) when are they worn? _____

11. How are mercury spills cleaned in your office?

12. Has the office ever been monitored for mercury vapors? ( )yes ( )no
comments (when, what method, results):

13. Are there any other precautions taken against mercury exposure that have not been discussed?

Thankyou for your time.

Chair - Patient head level -

floor level - tile

rug

Dentist - cloth

plastic

Assistant - cloth

plastic

Sink

Garbage

Instrument tray

Amalgamator

Fresh air inlet

Vacuum cleaner

Waste container - open

closed

Furnace - filters

Curtains

Silva ejector

Waiting room

Reception area

Hall

Laboratory

Office

Other (list)

APPENDIX IV

Table IX Compares the type of procedure used for amalgam preparation, the number of amalgam related procedures during monitoring, and per month, the type of capsules used, the average personal air sample results and elevated hair or urine tests (refer to code at bottom of the table).

TYPE OF PROCEDURE	NUMBER OF AMALGAMS		CAPSULE TYPE	PERSONAL AIR SAMPLES ug/m³	HAIR	URINE
	per 4 hours	per month				
DD	3	120	Reusable	11		
SQ [illegible] RD	6	200	Reusable	8.5	Elevated	
SQ [illegible] RD	6	400	Reusable	10.5		
DD	3	(1 oz)	Reusable	12		
SQ [illegible] RD	1	40	Reusable	22		Elevated
SQ [illegible] RD	3	240	Reusable	9		
DD	4	200	Disposable	5		
DD	4	500	Disposable	32		
SQ [illegible] RD	10	(16 oz)	Reusable	24		Elevated (?)
DD	7	240	Reusable	11		
DD	3	300	Disposable	5		
SQ [illegible] RD	3	20	Reusable	9		
SQ [illegible] RD	2	120	Reusable	18		
SQ [illegible] RD	0	70	Reusable	22	Elevated	
DD	3	120	Reusable	20		
SQ [illegible] RD	3	200	Reusable	17	Elevated	
DD	6	200	Reusable	9		
SQ [illegible] RD	3	300	Reusable	13	Elevated	
SQ [illegible] RD	2	120	Reusable	12.5		Elevated
SQ [illegible] RD	4	120	Reusable	15.7		Elevated
DD	7	600	Reusable	29.5		
DD	1	120	Reusable	41.7		Elevated
SQ [illegible] RD	0	20	Reusable	8.5		
DD	5	40	Reusable	9		
DD	0	400	Reusable	5.2		
DD	3	420	Reusable	2.4		Elevated (?)
DD	0	200	Reusable	2.5		
DD	3	150	Disposable	12		Elevated
SQ [illegible] RD	0	80	Reusable	2		
SQ [illegible] RD	2	100	Reusable	6	Elevated	
SQ [illegible] RD	6	250	Disposable	7.5		
DD	3	200	Reusable	4.3		
DD	0	100	Disposable	7		
DD	12	250	Reusable	41.5		Elevated
DD	1	400	Reusable	7	Elevated	Elevated

DD = Dappen Dish

SQ [illegible] RD = Squeeze Cloth with Rubber Dam

SQ [illegible] RD = Squeeze Cloth without Rubber dam